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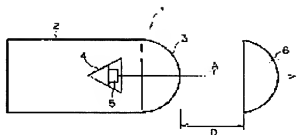
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(54) LED LIGHT SOURCE DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an LED light source device that has high efficiency.

SOLUTION: An LED light source device has an LED light source module 1 and another lens 6. In the LED light source module 1, an LED luminous element 5 is formed in one body to a convex 3. Another lens 6 is provided on an optical axis and the distance D in the optical axis between the front tip of the convex lens 3 and LED luminous element 5 of the other lens 6 is 1.0 times the maximum length of the vertical or larger to the optical axis of LED module 1. The light source device is formed with the several units of the LED module 1 and another lens 6.



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CLAIMS

[Claim(s)]

[Claim 1] In the LED light equipment using the LED module which consists of an LED light emitting device and a convex surface-like lens which was united in this LED light emitting device Another different lens from said convex surface-like lens is prepared in the direction of an optical axis of this LED module. LED light equipment with which distance of the direction of an optical axis of the tip of said convex surface-like lens and the end face by the side of said LED light emitting device of said another lens is characterized by being 1.0 or more times of the vertical maximum length to the direction of an optical axis of said LED module.

[Claim 2] LED light equipment characterized by said another lens consisting of at least two or more lenses piled up in the direction of an optical axis in LED light equipment according to claim 1.

[Claim 3] LED light equipment characterized by forming said LED module and said another lens in one in LED light equipment according to claim 1 or 2.

[Claim 4] LED light equipment characterized by making it come to arrange at least two or more LED light source units which come to combine said LED module and said another lens in claim 1 thru/or LED light equipment given in any 1 of 3.

[Claim 5] LED light equipment with which three or more LED light source units which come to combine said LED module and said another lens are arranged, and the array of this LED light source unit is characterized by being a line in a vertical plane to the direction of an optical axis in claim 1 thru/or LED light equipment given in any 1 of 3.

[Claim 6] LED light equipment characterized by being arranged so that it may become a rectangle with the number of arrays of n (m and n are an integer) which the LED light source unit which comes to combine said LED module and said another lens m Hangs in a vertical plane to the direction of an optical axis in claim 1 thru/or LED light equipment given in any 1 of 3.

[Claim 7] In claim 1 thru/or LED light equipment given in any 1 of 3, two or more arrays of the LED light source unit which comes to combine said LED module and said another lens are carried out. This array LED light equipment characterized by coming to arrange repeatedly, these three adjoining LED light source units being the arrays which become triangle-like in a vertical plane to the direction of an optical axis, and using as one unit three LED light source units arranged in the shape of [this] a triangle.

[Claim 8] LED light equipment characterized by the lens base configuration within the vertical plane over the direction of an optical axis of said another lens being a polygon in claim 1 thru/or LED light equipment given in any 1 of 7.

[Claim 9] It is LED light equipment characterized by said LED module having at least the part whose configuration of the vertical section to the direction of an optical axis of this LED module is a polygon in claim 1 thru/or LED light equipment given in any 1 of 8.

[Claim 10] claim 1 thru/or LED light equipment given in any 1 of 7 — setting — said another lens — this — the LED light equipment which the lens base configuration within the vertical plane over the direction of an optical axis of another lens is a polygon, and is characterized by said LED module having at least the part whose configuration of the vertical section to the direction of an optical axis of this LED module is a polygon.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention on LED light equipment and a twist concrete target The angle of divergence of the light which carried out outgoing radiation from the LED light emitting device by preparing another lens ahead [of an LED module / direction of optical axis] is stopped small. It is related with the LED light equipment which makes easy justification of an optical axis with a lens different from an LED module with the configuration within the vertical plane over the optical axis of an LED module, and the configuration within the vertical plane over the optical axis of another lens, concerning the LED light equipment which calculates the increase in efficiency for Mitsutoshi Taka. Moreover, it is related with two or more arranged LED light equipment.

[0002]

[Description of the Prior Art] Since LED light equipment has advantages, such as a miniaturization of equipment, and reinforcement of the light source, as the light source in displays, such as for example, projector equipment, marketability is expected. In recent years, big screen-ization of a display is progressing, and in order to illuminate this whole big screen brightly, the increase in efficiency for Mitsutoshi Taka is demanded. There is a method of installing a lens different from the geometric design of an LED module and an LED module in the method of the optical-axis kickback as a technique about the increase in efficiency for Mitsutoshi Taka of LED light equipment. Moreover, what arranged the lens different from two or more LED modules is used as the two-dimensional light source.

[0003] Drawing 15 is a schematic diagram for explaining the example of a configuration of the conventional LED module, and, for the cylindrical section and 3, the convex surface-like lens section and 4 are [one / an LED module and 2 / an LED light emitting device and A of a reflecting mirror and 5] opticals axis among drawing. The LED module 1 is made of transparence resin, and is carrying out the projectile-like configuration where the convex surface-like lens section 3 of the shape of the shape of the cylindrical section 2 and the spherical surface which the inclination attached, or an ellipse was united. The LED light emitting device 5 is being fixed in the conic reflecting mirror 4, and this conic reflecting mirror 4 is buried into the resin of the cylindrical section 2.

[0004] Said conic reflecting mirror 4 aims at condensing. The LED light emitting device 5 is the surface light source, and its optical axis A is perpendicular to the field of this surface light source. What carried out outgoing radiation is reflected in the direction to which it inclined greatly with this conic reflecting mirror 4 from an optical axis A among the light which carried out outgoing radiation from the LED light emitting device 5 of this surface light source, and it is condensed in the direction of an optical axis A. Moreover, as the quality of the material of the LED light emitting device 5, organic and inorganic any are sufficient.

[0005] The light which inclined greatly and carried out outgoing radiation from the optical axis A as the light by which outgoing radiation was carried out in accordance with the optical axis A among the light which carried out outgoing radiation progresses as it is and the LED light emitting device 5 was mentioned above is condensing **** to the direction of an optical axis A with the conic reflecting mirror 4. Such light which came out of the cylindrical section 2 of an LED module is collected in the direction of an optical axis A in the convex surface-like lens section 3 of an LED module. It becomes important to store the light which came out of the LED light emitting device 5 in a narrow angle of divergence, when calculating the Takamitsu use increase in efficiency at this time.

[0006] As a technique about the conventional LED module, the optimization technique of the geometric design

of an LED module is mentioned. For example, by JP,11-46013,A, the configuration of the LED module lens section was specified as the ellipse curved surface (formula : $X^2/2.42 + y^2 / 3.02 = 1$), and it has stated that this configuration is suitable. Moreover, it is said that it is shown that the distance at an LED chip and the tip of the convex surface-like lens section of an LED module also serves as an important element of the increase in efficiency for Mitsutoshi Taka, and there is the optimal range for this distance. However, in this geometric design, the number of strange good parameters has a limit.

[0007] Moreover, optimization of the geometric design of a conic reflecting mirror is also effective in condensing. However, the number of strange good parameters has a limit like the geometric design of the above-mentioned LED module also about this.

[0008] Moreover, if it will be complicated even if the optimal structure is found about the geometric design of the convex surface-like lens section of an LED module, and a conic reflecting mirror, it cannot necessarily realize as a problem on manufacture / processing.

[0009] Moreover, JP,10-333599,A has described use of LED light equipment as the light source of projector equipment. Here, the array of an LED module and the array of a micro lens are used as a technique of calculating the Takamitsu use increase in efficiency. It takes in to the micro lens in which the light which carried out outgoing radiation from the LED module was prepared ahead [optical-axis] theoretically, light is operated orthopedically in parallel, emission of light is suppressed, and the Takamitsu use increase in efficiency is calculated. However, justification of an LED module and the optical axis of a micro lens poses a problem here. Moreover, in case an LED module with the circular configuration of a vertical plane over an optical axis is made to arrange, it is arranged so that spacing may be mutually vacant. For this reason, a clearance is generated in an array and the filling factor of the LED light equipment in a certain area falls. Moreover, in case a circular LED module is made to arrange on a certain base, the problem that the optical axis of each LED module and the optical axis of each micro lens shift arises.

[0010]

[Problem(s) to be Solved by the Invention] As mentioned above, in order to attain the increase in efficiency for Mitsutoshi Taka with the geometric design of an LED module, and the geometric design of a conic reflecting mirror, since a parameter has a limit, there is a limitation, and there is also a problem on manufacture / processing. There is a problem of justification of an optical axis with a lens different from an LED module also about the approach of aiming at improvement in the efficiency for light utilization by preparing another lens ahead of an optical axis from the LED module with which the fault of the conventional LED module independent use was compensated on the other hand. Moreover, since a clearance is generated in LED light equipment about the array of LED light equipment, in case that the filling factor falls poses a problem and an LED module is made to arrange further, that the optical axis of LED modules shifts poses a problem.

[0011] This invention is made in view of the actual condition like ****, and it is based on using a lens different from an LED module. By setting a minimum as distance with a lens different from an LED module, and combining two or more lenses as still more nearly another lens In order to offer the LED light equipment which can attain the increase in efficiency for Mitsutoshi Taka rather than the conventional LED module and to solve the problem of justification of an optical axis with a lens different from an LED module, The light equipment made into the array of an LED module, the array of another lens, and one is offered. Furthermore, by offering the high LED light equipment of a filling factor by the array approach of an LED module, and changing the configuration of a vertical plane over the configuration of a vertical plane over the optical axis of an LED module, and the optical axis of another lens It aims at offering the LED light equipment which makes easy justification of the optical axis of each LED light equipment.

[0012]

[Means for Solving the Problem] In the LED light equipment using the LED module which consists of a convex surface-like lens with which invention of claim 1 was united in the LED light emitting device and this LED light emitting device Another different lens from said convex surface-like lens is prepared in the direction of an optical axis of this LED module. Distance of the direction of an optical axis of the tip of said convex surface-like lens and the end face by the side of said LED light emitting device of said another lens is characterized by being 1.0 or more times of the vertical maximum length to the direction of an optical axis of said LED module.

[0013] Invention of claim 2 is characterized by said another lens consisting of at least two or more lenses piled up in the direction of an optical axis in invention of claim 1.

[0014] Invention of claim 3 is characterized by forming said LED module and said another lens in one in claim 1 or invention of 2.

[0015] Invention of claim 4 is characterized by making it come to arrange at least two or more LED light source units which come to combine said LED module and said another lens in claim 1 thru/or invention of any one of 3.

[0016] Invention of claim 5 arranges three or more LED light source units which come to combine said LED module and said another lens in claim 1 thru/or invention of any one of 3, and the array of this LED light source unit is characterized by being a line in a vertical plane to the direction of an optical axis.

[0017] Invention of claim 6 is characterized by being arranged so that it may become a rectangle with the number of arrays of n ($m \times n$; m and n are an integer) which the LED light source unit which comes to combine said LED module and said another lens m Hangs in a vertical plane to the direction of an optical axis in claim 1 thru/or invention of any one of 3.

[0018] Two or more arrays of the LED light source unit with which invention of claim 7 comes to combine said LED module and said another lens in claim 1 thru/or invention of any one of 3 are carried out. This array These three adjoining LED light source units are the arrays which become triangle-like in a vertical plane to the direction of an optical axis, and are characterized by coming to arrange them repeatedly, using as one unit three LED light source units arranged in the shape of [this] a triangle.

[0019] Invention of claim 8 is characterized by the lens base configuration within the vertical plane over the direction of an optical axis of said another lens being a polygon in claim 1 thru/or invention of any one of 7.

[0020] It is characterized by invention of claim 9 having at least the part whose configuration of a vertical section [as opposed to the direction of an optical axis of this LED module in said LED module] is a polygon in claim 1 thru/or invention of any one of 8.

[0021] invention of claim 10 — claim 1 thru/or invention of any one of 7 — setting — said another lens — this — the lens base configuration within the vertical plane over the direction of an optical axis of another lens is a polygon, and it is characterized by said LED module having at least the part whose configuration of the vertical section to the direction of an optical axis of this LED module is a polygon.

[0022]

[Embodiment of the Invention] The gestalt of the operation of this invention to the following is explained to a detail below. In addition, in the complete diagram for explaining an operation gestalt, the same sign is attached to the part which has the same function, and explanation of the repeat is omitted. Drawing 1 is the schematic diagram showing the model of the LED light equipment corresponding to claim 1 of this invention, and, for the cylindrical section and 3, the convex surface-like lens section and 4 are [one / an LED module and 2 / an LED light emitting device, lens with 6 / another / a convex configuration /, and A of a reflecting mirror and 5] optical axis among drawing. The configuration of the cylindrical section 2 of the LED module 1 is a cylinder, the diameter is 1.1mm and the convex surface-like lens section 3 at a tip is hemispherical, that by which the configuration of the cylindrical section 2 of the LED module 1 is limited to a cylinder here — it is not — an ellipse form — being pillar-shaped. Moreover, the diameter of the cylindrical section 2 of the LED module 1 is not limited to 1.1mm, and even if it is larger than this magnitude and it is small, it is not cared about. Moreover, the configuration of the convex surface-like lens section 3 may not be limited in the shape of a semi-sphere, and may be a half-ellipse-like.

[0023] Moreover, in this example, the plano-convex lens is used as another convex surface-like lens 6. The configuration of a vertical plane over an optical axis A is circular, and the diameter is the 1.1 samemm as the cylindrical section 2 of the LED module 1. Although that diameter is not limited to 1.1mm here and it does not matter that it is large as it is smaller than this magnitude, in case two or more LED light equipment is made to arrange, in order that the magnitude of the vertical plane over the optical axis of this another lens 6 may determine the filling factor of an LED module, it is desirable whether it is equivalent to the magnitude of the vertical plane over the optical axis of the LED module 1 and that it considers as less than [it]. The distance D on the optical axis A with the LED module 1 side-edge side of the lens 6 different from the lens section tip of this LED module 1 is 3.45mm, and becomes larger than die length of 0.55mm on the optical axis of another lens 6, and the conditions about distance with a lens different from the LED module 1 which can be set claim 1 are fulfilled.

[0024] Drawing 2 is the graph which shows the result obtained by performing ray-tracing count based on the above-mentioned LED light equipment, took arbitration reinforcement along the axis of ordinate, and took the angle of divergence along the axis of abscissa. The half power angle α is the value of an angle of divergence in case the value of the arbitration reinforcement of an axis of ordinate becomes half [of the highest reinforcement]. It was 8.9 degrees when the half power angle was searched for from the graph shown in

drawing 2.

[0025] Drawing 3 is a graph which shows the result of the ray-tracing count by the configuration of only the LED module 1 without forming another lens 6. When the half power angle $\alpha 2$ is searched for from this graph, it is 11.4 degrees, and the condensing effectiveness by installation of another lens 6 is accepted. Here, it is appropriate to establish the above-mentioned distance conditions for distance with the lens 6 different from the above-mentioned LED module 1, zero, i.e., since it is made to contact and an angle of divergence sometimes spreads.

[0026] Drawing 4 is the schematic diagram showing the model corresponding to claim 2 of this invention. Although the above-mentioned LED module 1 is the same as the configuration shown in drawing 1, what prepared two sheets, plano-concave lens 6a and biconvex lens 6b, is used as another lens 6. Here, the number of sheets of the lens used for this another lens 6 may not be limited to two sheets, and may be three or more sheets. Moreover, about the combination of a lens, it is not limited to using plano-concave lens 6a and biconvex lens 6b, and you may consist of many lenses like a camera lens. The distance D in the optical-axis top A from the end face by the side of the LED module 1 of plano-concave lens 6a in another lens 6 which consists of two lenses to the point of the convex surface-like lens section 3 of the LED module 1 is 3.25mm, and fulfills the conditions of the above-mentioned distance in claim 1. As effectiveness which can be expected when constituted combining two or more lenses as this another lens 6, it is thought that it is effective not only for condensing but control of aberration, such as chromatic aberration.

[0027] Drawing 5 is a graph which shows the result of the ray-tracing count by the LED light equipment of the above-mentioned configuration. The half power angle $\alpha 3$ searched for from this graph is 9.5 degrees, and serves as a value smaller than the half power angle acquired from this count result when not installing the another above-mentioned lens 6, and the condensing effectiveness by installation of another lens which combined two lenses is accepted.

[0028] The lens 6 with claim 3 of this invention different from the LED module 1 is constituted by one. Of course, a configuration the lens 6 different from the LED module 1 did the LED light equipment with which the lens 6 different from the LED module 1 was united from the quality of the material of resin etc. and which tied and is connected in the section also includes the configuration in which the lens different from LED light equipment is installed on the susceptor which are components other than these two.

[0029] It could really operate orthopedically by mold plastic surgery etc., where an optical axis is justified, when the lens 6 different from the LED module 1 ties and it is connected in the section. Moreover, when the lens 6 different from the LED module 1 is not installed on susceptor, the centering-control device of an optical axis should be prepared in either the LED module 1 or another lens 6.

[0030] Drawing 6 is a schematic diagram for the location of the optical axis A1 of the LED module 1 and the optical axis A2 of another lens 6 to explain a condition when only distance d shifts. The distance D with the module side edge side of the lens 6 different from the tip of the LED module 1 is 3.45mm. When ray-tracing count was performed based on this arrangement, a result came to be shown in drawing 7 and the half power angle $\alpha 4$ at this time was 21.0 degrees. It turns out that an angle of divergence becomes large as compared with the result depended on the configuration of drawing 1 with which optical axis A1 and A2 have agreed. It turns out that justification of an optical axis is more important than this.

[0031] Drawing 8 is the schematic diagram showing the example corresponding to claim 4 of this invention, and is the schematic diagram showing the light equipment 10 with which it comes to allot two LED light source units which consist of an LED module 1 and another lens 6. The lens 6 different from the two-set LED module 1 is contacted, and is arranged. That is, two LED modules 1 touch mutually, and two other lenses 6 are each other carrying out contact. The distance (distance with the LED module side edge side of a lens different from an LED module tip) D of two LED modules 1 and two other lenses 6 is 1.45mm. When two or more above-mentioned LED light source units are put in order, about the conditions about the distance D with the lens 6 different from the LED module 1 of claim 1, the conditions of distance are fulfilled based on one LED light equipment (namely, LED light source unit here).

[0032] The half power angle acquired by performing ray-tracing count with the configuration shown in above-mentioned drawing 8 was 9.1 degrees. Moreover, as a result of performing this ray-tracing count at the time of not forming two other lenses 6, the acquired half power angle was 9.3 degrees. From this result, also when a two-set LED light source unit was made to arrange, the condensing effectiveness by having installed another lens was accepted slightly.

[0033] the schematic diagram showing the example corresponding to claim 5 of this invention in drawing 9 -- it

is -- a line -- it is drawing showing LED light equipment. The LED light equipment 10 of this example is what arranged the LED light equipment (LED light source unit with the lens 6 different from the LED module 1) by the above-mentioned independent module in five lines, and each LED module 1 and each another lens 6 touch mutually. In this example, although five LED light source units are made to arrange on a straight line, the approach of an array may not be limited to a straight line and may be a curve-like. Moreover, the number of the LED light source units to put in order is not limited to five pieces, and should just be three or more pieces. However it may arrange in the case of two LED light source units, it will arrange on a straight line, but if it is three or more pieces, it is possible to arrange in the shape of [of arbitration] a curve as well as arranging in the shape of a straight line. Moreover, the distance D on an optical axis with the lens 6 different from the LED module 1 is 3.45mm.

[0034] Ray-tracing count was performed with the configuration shown in above-mentioned drawing 9. Moreover, this count with the time of not forming another lens 6 was also performed. When the half power angle compared, the way when forming another lens 6 had the slightly small half power angle, and the condensing operation by installation of another lens 6 has been checked also in the LED light equipment in a linear unit array.

[0035] Drawing 10 is the schematic diagram showing the example corresponding to claim 6 in this invention, and the strabism schematic diagram of an LED light source module is shown in drawing 10 (A), and it shows a side-face schematic diagram to drawing 10 (B). The LED light equipment 10 of this example is arranged so that it may become perpendicular mutually by the number of 2 which m Hangs an LED light source unit on n to hang two with the configuration of drawing 10 by coming to arrange (m and n being an integer) about an LED light source unit with the lens 6 different from the LED light source module 1. Moreover, two or more LED light source modules 1 and two or more another lenses 6 touch mutually in all directions. Although a clearance may be generated between LED light source units here, if the area made to arrange in this case is fixed, the way made to arrange like this example, without opening spacing is able to arrange more LED light source units. Moreover, in the array of n m Hung here, although m and n showed the configuration in the case of being equal, m and n may be the arrays of the shape of a rectangle which is not equal.

[0036] Drawing 11 is the schematic diagram showing the model of the example corresponding to claim 7 of this invention, and shows the part of three LED light source units [in / for the example of a configuration of the LED light equipment of this example which put nine independent LED light equipment (namely, LED light source unit with an LED light source module and another lens) in order / the configuration of drawing 11 (A)] to drawing 11 (A) at drawing 11 (B). The configuration of this example is characterized by having located the array in a line on a triangle, when three units are observed, as shown in drawing 11 (B).

[0037] As compared with the configuration with which the LED light source unit of the above-mentioned n to m Hang was arranged perpendicularly mutually, it turns out that the LED light source unit has arranged the configuration of this example densely in the direction of y of an array. Although the distance of x directions shown in drawing 11 (A) is set to 4r in two LED light source units in x directions when the radius of the LED module 1 is set to r, in the array of three LED light source units 13, the height is set to $2+\sqrt{3}r$, it is shorter than 4r, and it turns out that it is choked up densely. When r is 1.1mm, and x directions are the 4.1mm of the directions of y and make four LED light source units arrange in this way to 4.4mm, the space for about one LED light source unit will be vacant as for them.

[0038] Drawing 12 is the schematic diagram in which corresponding to claim 7 of this invention, and a vertical lens base configuration's being a square, and showing the configuration in the case of a square (drawing 12 (A)), and the configuration (drawing 12 (B)) which they arranged to the optical axis in another lens. As a configuration of a perpendicular flat surface over the optical axis of another lens 6, you may be a triangle besides a square, and a hexagon. It is not necessary to limit them to an equilateral triangle, a square, and a forward hexagon, and as long as these configurations are the same configurations, they may be hexagons other than squares other than triangles other than an equilateral triangle, and a square, i.e., a rectangle, or a forward hexagon. Moreover, the convex surface-like lens in another lens 6 is not what is limited hemispherical and in the shape of a half-ellipsoid. When the polygon of such same configuration of the aspheric surface is made to arrange, it compares with the case of the another above-mentioned circular lens. The manufacture becomes easy in order for what is necessary to be to be able to make two or more another lenses 6 as one, and just to also perform justification of an optical axis to the whole possible [making it arrange without producing a clearance between another lenses 6].

[0039] Drawing 13 is the schematic diagram showing the LED light equipment which it corresponds to claim 9 in

this invention, and the configuration within the vertical plane over the optical axis of an LED module is a square, and they arranged in the case of a square. As shown in drawing 13 (A), a triangle besides a square and a hexagon can be considered as a configuration (it is the cross-section configuration of a vertical plane to the optical axis except the convex surface-like lens section) of one LED module 1. Although an equilateral triangle, a square, and a forward hexagon are also available, of course, if these configurations are the same configurations, even if they are hexagons other than triangles other than an equilateral triangle and squares other than a square, i.e., a rectangle, and a forward hexagon, they will not be cared about. When the polygon of such same configuration is made to arrange, it becomes easy in order for what is necessary to be it to be possible to make it arrange as compared with the case of the LED module of the above-mentioned circular cross section, without producing a clearance in an LED inter module, and to be able to make two or more LED modules as one, and just to also perform justification of an optical axis to the whole.

[0040] the vertical lens base configuration as opposed to [drawing 14 corresponds to claim 10 of this invention, and] the optical axis of another lens -- a square -- and the vertical configuration (it is the cross-section configuration of a vertical plane to the optical axis except the convex surface lens section) as opposed to [are a square and] the optical axis of an LED module -- a square -- and it is a square and the LED light source unit by them is the schematic diagram showing the arranged configuration. Each is not restricted to the configurations of a square and a square, the above-mentioned configurations of the LED module 1 may be [a hexagon and the above-mentioned configuration of another lens] triangles, for example, the combination of the above-mentioned configuration with the lens 6 different from the LED module 1 can consider much combination. In this case, one creation with two or more LED modules 1 and two or more another lenses 6 is attained. Moreover, since justification of two or more LED modules 1 and the optical axis of two or more another lenses 6 is one, both can carry out easily.

[0041]

[Effect of the Invention] The LED light equipment with which optical-axis adjustment becomes easy can be offered by condensing the light which carried out outgoing radiation from the LED module by using a lens different from an LED module according to this invention, being able to calculate the Takamitsu use effectiveness, as explained above, and treating these both as one. Moreover, when carrying out two or more arrays of the unit of an LED light source module and another lens, it can be made to arrange by the high filling factor by the array approach. Furthermore, by making the cross-section configuration or lens base configuration of an LED module and another lens into a polygon, it is possible to treat an array as one and, for this reason, justification of an optical axis can offer easy LED light equipment.

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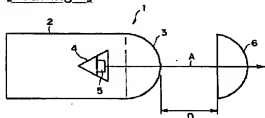
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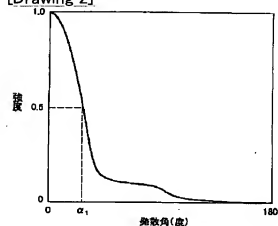
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DRAWINGS

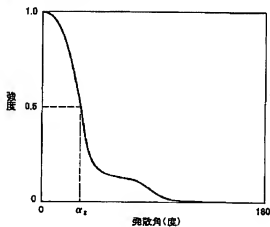
[Drawing 1]



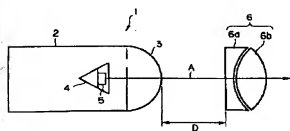
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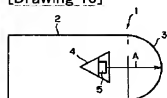
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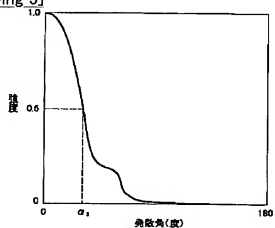
[Drawing 4]



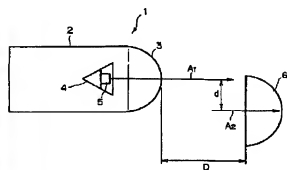
[Drawing 15]



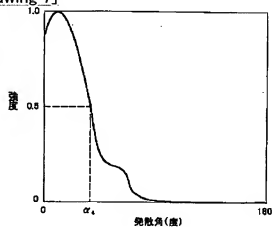
[Drawing 5]



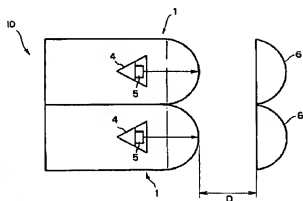
[Drawing 6]



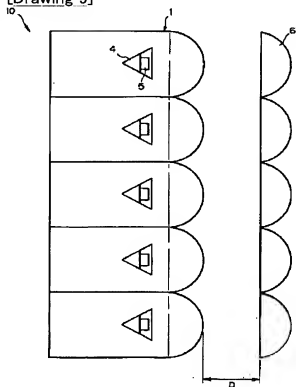
[Drawing 7]



[Drawing 8]

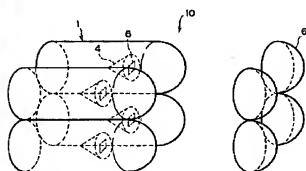


[Drawing 9]

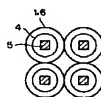


[Drawing 10]

(A)

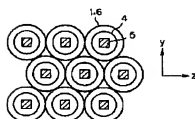


(B)

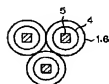


[Drawing 11]

(A)

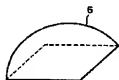


(B)

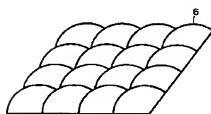


[Drawing 12]

(A)

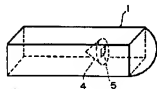


(B)

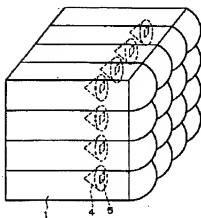


[Drawing 13]

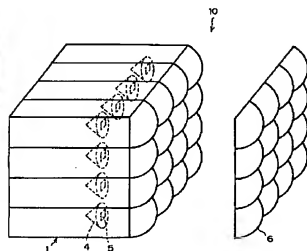
(A)



(B)



[Drawing 14]



[Translation done.]